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Demand for Health Insurance by Military Retirees

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Executive Summary

About three million military retirees and their dependents less than 65 years of age ("Retirees") are eligible for group health insurance from the Department of Defense (DoD) under the TRICARE program. TRICARE offers three health plans: Prime, a health maintenance organization (HMO); Standard, a fee-for-service plan (FFS); and Extra, a preferred provider organization (PPO). (Standard and Extra, similar plans, are combined in the empirical analysis as "S/E.") Under TRICARE, Retirees obtain "direct care" at military facilities (usually from military providers) and "purchased care" at civilian facilities from civilian providers.

TRICARE is relatively inexpensive compared to other health insurance (OHI) that can be obtained from civilian employers. However, according to surveys of beneficiaries, some Retirees are dissatisfied with the access and/or quality of care that they receive from military providers, and some using civilian providers are dissatisfied with purchased care claims processing. As a result, many have obtained other health insurance (OHI), and this reduces DoD health care costs.

The Office of the Director, Cost Assessment and Program Evaluation asked the Institute for Defense Analyses (IDA) to assist with out-year budgeting by analyzing past military health care utilization as a basis for forecasting future utilization and costs. In reviewing data from a thirteen-year period, IDA's research team found that in Fiscal Year (FY) 2000, 46 percent of retiree families had OHI, but by FY 2012, that number had dropped to 20 percent, with a corresponding rise in TRICARE usage. The return of previously non-reliant beneficiaries sharply increased TRICARE costs, leading to the questions of what caused the return of "ghost" beneficiaries to TRICARE and whether the trend will continue.

This paper answers these questions by analyzing the demand by Retirees for three broad health insurance plan types, two (Prime and Standard/Extra (S/E) discussed above) offered by TRICARE and one (OHI) offered by civilian employers. The analysis is performed using a conditional logit model with individual-level data in FYs 2000–2012 (181,153 observations). The model is used to estimate insurance choice elasticities by plan for premiums, out-of-pocket (OOP) expenses, income, and other factors. These are used to explain the switching that occurred from OHI to TRICARE in FYs 2000–2012.

Retirees switched to TRICARE primarily because of sharp increases in *relative prices*: OHI premiums and OOP expenses rose, while those under TRICARE declined.

Other contributing factors were increases in unemployment, declines in eligibility of civilian workers for OHI, and declines in real disposable income.

A major factor was an increase in OHI premiums. Between FY 2000 and FY 2012 the growth of OHI premiums adjusted for general inflation averaged 7.2 percent per year. It is expected to slow down; the Centers for Medicare & Medicaid Services (Office of the Actuary) predicts only a modest increase in FYs 2013–2018 premiums for all private sector workers after adjusting for general inflation. We believe this will substantially lower the switching rate. However, unless DoD indexes TRICARE premiums and OOP expenses to those of OHI, DoD faces the continued return of formerly non-reliant beneficiaries and chronic above-average health care cost growth.

The cost of health care under each plan includes both premiums and OOP expenses. We find that both cost components affect the demand for insurance. Previous analyses have analyzed the demand for *civilian* health insurance. These analyses typically include only premiums, which results in a serious underestimate of the price elasticity. For example, the average premium elasticity for a civilian HMO in previous analyses is -0.38. By omitting OOP expenses, they overestimate the effect of premiums and underestimate the total price elasticity. For the military HMO, we estimate elasticities of -0.25 for premiums and -0.43 for OOP expenses. The total price elasticity, the sum of both, is -0.68. While still inelastic, the demand for broad types of health insurance plans is much more sensitive to price than previously thought, and OOP expenses are a key determinant. For forecasting and policy analyses, one should take both premiums and OOP expenses into account.

Contents

1. Introduction

A. Background

About 3 million military retirees and their dependents less than 65 years of age ("Retirees") are eligible for Department of Defense (DoD) health care under the TRICARE program. Retirees obtain "purchased care" from civilian providers that is subject to more or less cost sharing, depending on the plan selected. They also obtain free "direct care" usually from military providers at a military treatment facility (MTF).[1] Access to direct care depends on the plan selected.

To evaluate the TRICARE program, DoD undertakes a large and extensive quarterly survey of adult military health care beneficiaries. Each Health Care Beneficiary Survey (HCBS) collects data on the TRICARE program and health insurance coverage. The surveys indicate that some Retirees are less satisfied with the access and/or quality of health care that they receive from military providers.[2] Some using civilian providers under TRICARE are dissatisfied with purchased care claims processing. As a result, many Retirees have purchased other group health insurance from civilian employers, thereby reducing DoD health care costs.

B. Problem

The Office of the Director, Cost Assessment and Program Evaluation asked the Institute for Defense Analyses (IDA) to assist with out-year budgeting by analyzing past military health care utilization as a basis for forecasting future utilization and costs. In reviewing data from a thirteen-year period, IDA's research team found that in Fiscal Year (FY) 2000, 46 percent of retiree families had OHI, but by FY 2012, 26 percent had switched to TRICARE. The return of previously non-reliant beneficiaries sharply increased TRICARE costs, leading to the questions of what caused the return of "ghost" beneficiaries to TRICARE and whether the trend will continue.

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1 A military hospital or clinic.

2 For evidence, see Stoloff et al., "Evaluation of the TRICARE Program: FY 2000 Report to Congress," IDA Paper P-3585 (Alexandria, VA: Institute for Defense Analyses, October 2000); Stoloff et al., "Evaluation of the TRICARE Program: FY 2001 Report to Congress," IDA Paper P-3662 (Alexandria, VA: Institute for Defense Analyses, October 2001); and Stoloff et al., "Evaluation of the TRICARE Program: FY 2002 Report to Congress," IDA Paper P-3728 (Alexandria, VA: Institute for Defense Analyses, October 2002).

C. Objectives and Format

This paper analyzes the demand by Retirees for broad types of group health insurance in FYs 2000–2012. It estimates insurance demand elasticities for premiums, out-of-pocket (OOP) expenses, income, and other factors.[3] These estimates are included in the Institute for Defense Analyses (IDA) TRICARE Cost Model, which is used by DoD for budgeting and policy analyses.

Chapter 2 discusses the insurance choices of beneficiaries. Chapter 3 reviews previous insurance studies. Chapter 4 presents the analysis; Chapter 5 provides a summary and conclusions. Appendix A and Appendix B discuss the measurement of two important explanatory variables—OOP expenses and real disposable income.

[3] Elasticity is a measure of the relationship between two variables. Specifically, it is the ratio of the percentage change in a dependent variable ($Y_1 - Y_0/Y_0$) to the percentage change in an independent variable ($X_1 - X_0)/X_0$).

2. Insurance Choices

A. TRICARE Program

1. TRICARE Plan Choices

Beneficiaries have three plan choices under TRICARE:[4] Prime, Standard, and Extra.

- TRICARE Prime is a health maintenance organization (HMO). Beneficiaries must enroll for a year to participate. Enrollment is open at all times, and eligibility is not based on any pre-existing medical condition. An enrollee chooses or is assigned a Primary Care Manager (PCM),[5] who refers patients to military and civilian medical specialists as needed.
- TRICARE Standard is a fee-for-service (FFS) plan. All beneficiaries can use it and no enrollment is required. There are substantial coinsurance payments. Since 2004, beneficiaries have been allowed to choose any civilian provider for care.[6]
- TRICARE Extra is a preferred provider organization (PPO). As with Standard, all beneficiaries can use it and no enrollment is required. Beneficiaries obtain care from a network of preferred civilian providers. Coinsurance payments are lower than those under Standard.

TRICARE Prime enrollees with military PCMs have first priority at MTFs, and that is where they get most of their care. TRICARE Prime enrollees with civilian PCMs and non-enrollees are eligible for free direct care at an MTF only on a space-available basis.

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4 For a recent review of the program, see the FY 2013 Evaluation of the TRICARE Program at http://tricare.mil/tma/dhcape/.../TRICARE2013%2002_28_13%20v2.pdf.

5 A PCM is a health care professional or medical team that a patient sees first for health care. Beneficiaries can either select a military PCM from a nearby MTF or request a civilian PCM who is a member of the contracted Prime network in a nearby community. TRICARE may assign patients to military PCMs at MTFs if there is unused capacity or assign them to civilian PCMs if MTF capacity is exceeded.

6 Under Standard, a beneficiary can go to any civilian provider for outpatient care. However, before December 28, 2003, those using Standard (and Extra) had to go to a military hospital for inpatient care unless it was unavailable. On that date, the policy changed, and they no longer have to first seek inpatient care at a military hospital.

Under Standard, beneficiaries may be required to pay the entire cost of care up front and then apply for reimbursement. Under Extra, beneficiaries pay only the coinsurance and providers file the claims. Beneficiaries are free to switch back and forth among network providers in Extra and non-network providers in Standard.

Under Prime, a beneficiary is required to use a nearby military hospital for inpatient care. If the nearest military hospital is greater than forty miles away or it cannot provide the needed inpatient care, the beneficiary can use a civilian provider. However, the beneficiary must first obtain a non-availability statement, i.e., a certification from the military hospital stating that it cannot provide the care. If one does not get a non-availability statement before getting inpatient care from a civilian source, TRICARE may not share the costs.

2. Cost Sharing for Retiree Families

Table 1 summarizes cost sharing in FY 2012 for Prime, Standard, and Extra. Retirees enrolled in Prime paid an annual premium (enrollment fee) of $260 for an individual and $520 for a family; there were no deductibles, and co-payments were nominal, e.g., $12 for outpatient visits. There was no premium to use TRICARE Standard/Extra (S/E); however, there was an outpatient deductible ($150 individual/$300 family) and substantial coinsurance, especially for inpatient care. Under all plans, prescription drugs from a retail pharmacy in the TRICARE network were relatively inexpensive: the co-pay for a 30-day supply was just $3 for a generic and $9 for a brand-name drug. Through the mail order pharmacy, a beneficiary could obtain a 90-day supply for the same low co-pays.

Table 1. TRICARE Cost Sharing for Retirees in FY 2012

Cost Category	TRICARE Standard	TRICARE Extra	TRICARE Prime
Annual enrollment fees	None	None	$260 individual; $520 family
Annual outpatient deductibles	$150 individual; $300 family	$150 individual; $300 family	None
Catastrophic cap	$3,000	$3,000	$3,000
Co-payments for outpatient visit to civilian doctor	25 percent[a]	20 percent[b]	$12 (outpatient medical) $25 (mental health) $30 (emergency room)
Prescription drugs			
Retail network	Up to a 30-day supply: $5 generic; $12 brand name (all plans)		
Mail-order pharmacy	Up to a 90-day supply: $3 generic; $9 brand name (all plans)		
Co-payments at civilian hospitals for inpatient care	Lesser of $535 per day or 25 percent of hospital charges, plus 25 percent of professional fees; for mental health, lesser of $187 per day or 25 percent of all charges[a]	Lesser of $250 per day or 20 percent of hospital charges, plus 20 percent of professional fees; for mental health, 20 percent of all charges[b]	$11 per day ($25 min. per stay); $40 per day for mental health
Ambulance service	25 percent[a]	20 percent[b]	$20
Outpatient surgery	25 percent[a]	20 percent[b]	$25
Preventive services	Not covered	Not covered	$0
Durable medical equipment	25 percent[a]	20 percent[b]	20 percent[b]

Source: http://tricare.mil/mybenefit/Download/Forms/Bene_Costs_10_07_Lo.pdf.

Note: Except for hospital co-payments, which increase annually, no major changes in cost sharing have occurred since FY 2001 when co-payments for drugs were reduced and the catastrophic cap was reduced from $7,500 to $3,000.

[a] Percentages are applied to the allowable charge. Beneficiaries could pay an additional 15 percent above that when non-participating providers are used.

[b] Percentages are applied to a negotiated amount that is less than the CMAC.

B. Other Private Health Insurance

In the civilian economy approximately three out of four *full-time* employees participate in employer-sponsored group health plans.[7] The typical employee pays about 30 percent of the company's total premium cost for family coverage; the employer pays the rest.[8] Premiums for employer-sponsored health plans (i.e., other health insurance, or OHI) vary mostly by the type of coverage, individual or family.[9] We will show in the next section that other health insurance premiums and out-of-pocket expenses are much higher than those under TRICARE.

Other health insurance allows beneficiaries to rely on civilian providers. Virtually all costs above the TRICARE Standard/Extra deductible are payable by OHI (first payer) and TRICARE (second payer).[10] Despite higher costs, beneficiaries presumably choose OHI to obtain better access and quality of care.

C. Insurance Choices in FY 2000–2012

To evaluate the TRICARE Program, DoD undertakes a large and extensive quarterly survey of adult military health care beneficiaries. The Health Care Beneficiary Survey (HCBS) collects data on health insurance coverage and, for the plan selected, data on the access and quality of health care provided.[11] We define three broad mutually exclusive plan choices: (1) Prime, (2) OHI, and (3) Standard/Extra (two similar plans that are combined in the empirical analysis as "S/E"). Table 2 reports the insurance distribution for Retirees in FYs 2000–2012 based on HCBS responses. In FY 2000 45.9 percent of Retirees chose OHI. OHI usage declined to 20.1 percent in FY 2012; most switched to Prime. This paper analyzes the insurance choices of Retirees in FYs 2000–2012 and explains their switching behavior.

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7 For example, see Bureau of Labor Statistics, "Employee Benefits in Medium and Large Private Establishments, 1997," Press Release USDL-99-02, January 7, 1999, 2. It is far less available to part-time workers.

8 Ibid., 10.

9 Most civilian employees choose a PPO (or FFS); about 15 percent choose an HMO. See Kaiser Family Foundation surveys of employee health benefits.

10 However, many retiree families with OHI do not bother to file a secondary purchased-care claim with TRICARE.

11 For details on the HCBS, see the TRICARE website, http://www.tricare.osd.mil/tricaresurveys/.

Table 2. Insurance Distribution for Retiree Families in FY 2000–2012 (Percent)

Sponsor	Insurance	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Retiree	Prime	28.6	29.7	32.1	35.4	39.0	41.9	43.5	45.9	47.1	48.4	50.5	52.2	53.4
	OHI[a]	45.9	44.9	42. 6	39.2	35.9	31.7	29.6	27.8	27.9	25.9	23.5	21.7	20.1
	Standard/ Extra	25.5	25.4	25.4	25.4	25.1	26.5	26.9	26.3	25.0	25.7	26.0	26.2	26.5

[a] About 4 percent of Retirees have both Prime and OHI; these are included in Prime.

3. Previous Empirical Studies

RAND and Mathematica[12] have reviewed previous empirical studies on the demand for employer-sponsored group health insurance. These studies have focused on the three standard broad types of insurance plans available: HMO, PPO, and FFS. Researchers typically estimate how premiums affect the type of plan selected. Table 3 summarizes the estimates of elasticities.

A. Premiums

Researchers have used a variety of logit and probit models to analyze the effect of premiums on insurance choice. Where possible, we report the HMO premium elasticity to facilitate comparisons among studies. The elasticity varies widely from -0.05[13] to -0.97.[14] The average elasticity among the studies is -0.38.[15]

The Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) Reform Initiative (CRI) was a demonstration project undertaken in 1988–93 that analyzed utilization by DoD beneficiaries under alternative health plans, including TRICARE Prime. In a follow-up survey of CRI participants, Hosek et al.[16] estimated a

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12 Jeanne S. Ringel et al., "The Elasticity of Demand for Health Care: A Review of the Literature and Its Application to the Military Health System," MR-1355 (Santa Monica, CA: RAND Corporation, 2002); and Su Liu and Deborah Chollet, "Price and Income Elasticity of the Demand for Health Insurance and Health Care Services: A Critical Review of the Literature, Final Report," MPR Reference No. 6203-042 (Washington, DC: Mathematica Policy Research, Inc., March 24, 2006), http://www.mathematica-mpr.com/publications/pdfs/priceincome.pdf.

13 P. F. Short and A. K. Taylor, "Premiums, Benefits, and Employee Choice of Health Insurance Options," *The Journal of Health Economics* 8 (1989): 293–311.

14 Anne Beeson Royalty and Neil Solomon, "Health Plan Choice: Price Elasticities in a Managed Competition Setting," *The Journal of Human Resources* 34, No. 1 (1998): 1–41, http://www.jstor.org /stable/146301.

15 The average elasticity for each study is used to compute the average among the studies. See also T. C. Buchmueller and Paul J. Feldstein, "The Effect of Price on Switching Among Health Plans," *The Journal of Health Economics* 16, No. 2 (1997): 231–247 and Bruce A. Strombom, Thomas C. Buchmueller, and Paul J. Feldstein, "Switching Costs, Price Sensitivity and Health Plan Choice," *The Journal of Health Economics* 21 (2002): 89–116, who estimate higher premium elasticities than in the other studies—i.e., greater than -1.0. We believe this is because they measure the effect of price differences both within and between plan types, as opposed to the literature that measures the effect mostly across plan types.

16 Susan D. Hosek et al., "Evaluation of the CHAMPUS Reform Initiative: Volume 3. Health Care Utilization and Costs," R-4244/3-HA (Santa Monica, CA: RAND Corporation, 1993).

probit regression model for TRICARE Prime enrollment and found a premium elasticity for Prime of -0.6. However, that study analyzed survey responses to changes in premiums for a (then) hypothetical DoD-sponsored HMO (Prime) versus CHAMPUS. It did not measure the effect of premiums on actual choices made under TRICARE, and OHI was not included as an alternative. Nevertheless, the study is particularly relevant and we cite its findings in later sections.

Table 3. Studies of Health Insurance Premium Elasticities

Study	Sample	Insurance Types	Model/Estimate
Cutler and Reber (1996)	Harvard University employees, panel data, 1994–95 and 1995–96	HMO vs. PPO	Logit -0.3 short-run -0.6 long-run
Marquis and Phelps (1987)	RAND Health Insurance Experiment sample, post-experiment survey responses to hypothetical plans, 1982	FFS supplementary insurance to cover co-payments	Probit -0.6
Short and Taylor (1989)	National Medical Care Expenditure Survey, cross-section data, 1977	HMO vs. high and low option FFS	Nested Logit -0.14 -0.05
Royalty and Solomon (1998)	Stanford University employees, panel data, 1994–95	HMO vs. PPO and FFS	Logit -0.29 Fixed-Effects Logit -0.97
Barringer and Mitchell (1994)	Single company (four locations) cross-section data	FFS vs. low option FFS, catastrophic FFS vs. HMO	Logit -0.1 to -0.2
Hosek, Goldman, Dixon, and Sloss (1993)	Military Health System Beneficiaries, survey responses to hypothetical plans, 1992	HMO vs. CHAMPUS	Probit -0.6
Feldman et al. (1989)	20 firms in Minneapolis, cross-section data, 1984	HMO vs. PPO and FFS	Nested Logit -0.15 to -0.53
Abraham, Vogt, and Gaynor (2002)	Medical Expenditure Panel Survey, cross-section data and two-earner households, 1996	HMO vs. PPO and FFS	Logit -0.13 to -0.14

Sources: Ringel et al., "Elasticity of Demand for Health Care," Table 3.3; and Jean Marie Abraham, William B. Vogt, and Martin S. Gaynor, "Household Demand for Employer-Based Health Insurance," Working Paper No. 9144 (Washington, DC: National Bureau of Economic Research, September 2002).

B. Out-of-Pocket (OOP) Expenses

Most previous studies do not measure the effect of OOP expenses (i.e., deductibles and co-payments). An exception is Barringer and Mitchell,[17] who find a small negative effect of plan deductible (their variable does not include co-payments). Feldman et al.[18] include separate deductibles and co-payments for inpatient and outpatient services. Results are mixed: some OOP variables reduce demand for insurance (expected effect), while others have an implausible sign, a positive effect. We suspect this is due to co-linearity among the OOP components.

C. Income

There is some evidence that income has a negative (positive) effect on HMO (FFS/PPO) choice.[19] For example, Hosek et al. estimate a -0.27 income elasticity for Prime enrollment.[20]

D. Other Factors

Researchers include demographics as a proxy for health status and "tastes." Previous studies usually find that age reduces HMO demand.[21] Hosek et al.[22] find that MTF travel time reduces Prime enrollment.

E. Critique of Previous Studies

Previous studies of the demand for group health insurance typically include only premiums as the measure of price. They find that premiums have a negative effect and

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17 M. W. Barringer and O. S. Mitchell, "Worker's preferences among company-provided health insurance plans," *Industrial and Labor Relations Review* 48, No. 1 (1994):141–152.

18 Feldman et al., "The Demand for Employment-Based Health Insurance Plans," *The Journal of Human Resources* 24 (1989): 115–142.

19 Barringer and Mitchell, "Worker's preferences among company-provided health insurance plans"; David M. Cutler and Sarah Reber, "Paying for Health Insurance: The Tradeoff between Competition and Adverse Selection," Working Paper No. 5796 (Washington, DC: National Bureau of Economic Research, October 1996); and Royalty and Solomon, "Health Plan Choice," find a statistically significant positive effect of income on FFS/PPO versus HMO selection. Short and Taylor, "Premiums, Benefits, and Employee Choice," and Abraham et al., "Household Demand," find a positive but insignificant effect.

20 Reported in Ringel et al., "Elasticity of Demand for Health Care."

21 See Hosek et al., "Evaluation of the CHAMPUS Reform Initiative"; Royalty and Solomon, "Health Plan Choice"; Cutler and Reber, "Paying for Health Insurance"; and Barringer and Mitchell, "Worker's preferences among company-provided health insurance plans."

22 Hosek et al., "Evaluation of the CHAMPUS Reform Initiative."

that demand is inelastic.[23] There is some evidence on income; very little on OOP expenses. Estimates are obtained with cross-section data so there is limited variability in prices; samples are not very large and mostly from the 1990s. Researchers have largely analyzed civilian plans; there is no empirical analysis of actual insurance choices by military health care beneficiaries.

Following most previous studies, we estimate a conditional logit model to analyze insurance choices among plan types. We analyze the actual insurance choices of military Retirees under TRICARE. We include a unique OOP variable that overcomes the difficulties observed in previous studies—a single measure that captures both deductibles and co-payments across all of the medical services. We estimate the model with a very large recent sample of 181,153 observations over thirteen years (FYs 2000–2012). From the logit model we derive current estimates of elasticities for premiums, OOP expenses, income, and other explanatory variables.

[23] There have been far fewer studies of the demand for individual/non-group coverage. These also find that demand is inelastic to premium changes (-0.2 to -0.6). For a review of these studies, see Liu and Chollet, "Price and Income Elasticity."

4. Health Insurance Demand Analysis

A. Expected Utility Theory

Researchers use expected utility theory to derive the demand for health insurance.[24] Utility is assumed to be a function of "other goods" and health; health is a function of medical care. An individual maximizes expected utility subject to a budget constraint and a medical care-to-health production function. Individuals buy health insurance because it can be purchased with before-tax dollars, it lowers OOP expenses, and they are financially risk averse.

Insurance choice can be viewed as a three-step process. First, determine the optimal other goods and expected medical care consumption under each plan, i.e., where marginal utility of foregone consumption equals the marginal utility of additional medical care. Second, calculate expected utility for each plan, a function of other goods and expected health. Third, rank plans and select the one that maximizes expected utility. *Expected utility maximization* implies that the demand for health insurance is a negative function of premiums, OOP expenses, and health status. It is also a function of income, but the effect is not determinate.[25]

A premium reduces the budget constraint so there is less income available for both other goods and health care. Consumption and utility are reduced because of an "income effect." But an increase in premiums does not affect relative prices, and there is no disincentive to use less medical care versus other goods.

OOP expense is the marginal price of health services. An increase reduces the amount of health care that can be purchased; this income effect reduces utility. But relative prices also change, which induces a change in the consumption mix of health care versus other goods. The "substitution effect" induces a second negative effect on utility. Given equal income effects for increases in premiums and OOP expenses, utility theory implies that a consumer is worse off by an increase in the latter. As a result, we

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[24] For theoretical discussions, see C. E. Phelps, *Health Economics* (New York: HarperCollins, 1992); John R. Wolfe and John H. Goddeeris, "Adverse Selection, Moral Hazard, and Wealth Effects in the Medigap Insurance Market," *The Journal of Health Economics* 10 (1991): 443–459; Peter Zweifel and Friedrich Breyer, *Health Economics* (New York: Oxford, 1997); and Peter Zweifel and Willard Manning, "Moral Hazard and Consumer Incentives in Health Care," in *Handbook of Health Economics, Vol. 1*, eds. A. J. Culyer and J. P. Newhouse (New York, Elsevier, 2000), 409–459.

[25] See Wolfe and Godeeris, "Adverse Selection, Moral Hazard, and Wealth Effects," Appendix.

expect the negative effect on insurance demand to be greater for OOP expenses than for premiums.

The medical treatment productivity curve is a positive function of health care access (timeliness) and quality (efficacy). DoD beneficiaries say that health care access and quality are greater for civilian versus military providers.[26] Not all civilian providers participate in the TRICARE Program., so under OHI, health care is likely to be delivered by a relatively larger network of nearby civilian providers.[27] This implies that health care under OHI is relatively more productive and convenient.[28]

We assume a military beneficiary family chooses the health plan that maximizes expected utility, taking into account plan access and quality. Marginal health benefits under OHI are greater than under TRICARE, but so are OOP expenses and premiums. For some families, greater total health benefits justify higher total costs, and they choose OHI; some think otherwise and choose a TRICARE plan. The next section estimates insurance models for military beneficiaries.

B. Model Specification

McFadden[29] has shown that a logit model can be derived from expected utility-maximization principles. Following McFadden, our research estimates a "conditional" logit model in which there are three insurance plan choices: (1) Prime, (2) OHI, and (3) S/E. We assume S/E is the "default choice" because all TRICARE beneficiaries are eligible and, unlike the others, it does not require enrollment.

The conditional logit model includes choice- and individual-specific factors.[30] Choice-specific factors vary with the plan selected by an individual. These include premiums and OOP expenses, as well as "dummies" for Prime and OHI to capture plan-specific intangible benefits. Individual-specific factors are those that do not vary with the plan selected. These are multiplied by the Prime and OHI dummies to allow for plan-specific effects. The individual-specific factors include real disposable family income, sponsor age groups (25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–64), proxies for travel time to the nearest MTF, and proxies for the availability of OHI. We

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[26] Some beneficiaries believe that access and quality are greater for military providers, but most believe otherwise.

[27] A beneficiary might still go to an MTF to fill prescriptions and get some health care, but most medical care would be obtained from nearby civilian providers.

[28] Especially compared to TRICARE Prime, which relies heavily on military providers.

[29] Daniel McFadden, "The Measurement of Urban Travel," *The Journal of Public Economics* 3 (1974): 303–328.

[30] William H. Greene, *Econometric Analysis* (New York: Macmillan, 1990), 696.

expect the marginal effects of premiums, OOP expenses and income to decline. This is captured by using the logarithmic form of the variables.

The variables were constructed using data from a variety of sources. Insurance choices for individual Retiree families are from the quarterly HCBSs in FYs 2000–2012. The HCBSs also provided demographic data on the sponsor's age, ZIP code, and family type.

Explanatory variables are based on data from other sources. An OOP expense index—a weighted average of co-pays for fixed bundles of medical services—was constructed for each plan (see Appendix A). For Prime and S/E, average co-pays are based on the administrative records for all beneficiary families with utilization under TRICARE. These data were provided by the TRICARE Management Authority (TMA). OHI premiums and co-pays are from the annual Medical Expenditure Panel Surveys (MEPSs) undertaken by the Department of Health and Human Services.

TMA also provided the ZIP codes of MTFs in Catchment Area Directory (CAD) files, used to estimate the distance to the nearest military hospital or clinic for Retiree families. The Bureau of Labor Statistics (BLS) provided data on unemployment and the availability of OHI for civilian employees. The BLS also provided a consumer price index for the urban population (CPI-U), which was used to adjust for general inflation.

Data from the 2003 Survey of Retirees were used to construct family income prediction models. The research team used the models and data from the BLS, HCBS, Internal Revenue Service (IRS) and DoD Actuary to predict real disposable incomes and marginal tax rates of HCBS respondents in FYs 2000–2012 (see Appendix B).

Premiums, OOP expenses, and family income are in constant after-tax dollars (base year FY 2012). Table 4 defines variables and provides data sources.

Table 4. Insurance Model Variables

Variable	Type	Data Sources	Definition
D1	Choice	HCBS FYs 2000–2012	Dummy variable (0/1) for Prime
D2	Choice	HCBS FYs 2000–2012	Dummy variable (0/1) for OHI
PREMIUM	Choice	BLS and MEPS FYs 2000–2012[a]	Logarithm of expected after-tax family premium divided by CPI-U (2012)
OOP	Choice	BLS and MEPS FYs 2000–2011[b] TMA FYs 2000–2012	Logarithm of family OOP index divided by CPI-U (2012)
INCOME*D1	Individual	BLS, DoD Actuary, HCBS, and IRS FYs 2000–2012; 2003 Survey of Retirees	Logarithm of expected real disposable family income divided by CPI-U (2012) times the PRIME dummy
INCOME*D2	Individual	BLS, DoD Actuary, HCBS and IRS FYs 2000–2012; 2003 Survey of Retirees	Logarithm of expected real disposable family income divided by CPI-U (2012) times the OHI dummy
AGEGROUPS*D1	Individual	HCBS FYs 2000–2012	Dummies for age groups 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–64 times the PRIME dummy
AGEGROUPS*D2	Individual	HCBS FYs 2000–2012	Dummies for age groups 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–64 times the OHI dummy
Proxies for Distance to MTF			
INCATCH*D1	Individual	CAD and HCBS FYs 2000–2012	Dummy variable (0/1) if respondent lives within 40 miles of a military inpatient facility times the PRIME dummy
INCATCH*D2	Individual	CAD and HCBS FYs 2000–2012	Dummy variable (0/1) if respondent lives within 40 miles of a military inpatient facility times the OHI dummy
INCLINIC*D1	Individual	CAD and HCBS FYs 2000–2012	Dummy variable (0/1) if respondent is not in a catchment area but lives within 20 miles of a military clinic that is a TRICARE enrollment site times the PRIME dummy
INCLINICD2	Individual	CAD and HCBS FYs 2000–2012	Dummy variable (0/1) if respondent is not in a catchment area but lives within 20 miles of a military clinic that is a TRICARE enrollment site times the OHI dummy

Variable	Type	Data Sources	Definition
Proxies for Availability of OHI			
SURVIVOR*D1	Individual	HCBS FYs 2000–2012	Dummy variable(0/1) if single survivor times the PRIME dummy
SURVIVOR*D2	Individual	HCBS FYs 2000–2012	Dummy variable(0/1) if single survivor times the OHI dummy
Unemployment*D 1	Individual	BLS and HCBS FYs 2000–2012	Overall civilian unemployment rate in the county times the PRIME dummy
Unemployment*D2	Individual	BLS and HCBS FYs 2000–2012	Overall civilian unemployment rate in the county times the OHI dummy
OHI Eligibility*D1	Individual	BLS and HCBS FYs 2000–2012	Percent of civilian employees eligible for employer-sponsored insurance in the county times the PRIME dummy
OHI Eligibility*D2	Individual	BLS and HCBS FYs 2000–2012	Percent of civilian employees eligible for employer-sponsored insurance in the county times the OHI dummy

[a] Employee share of OHI premiums.

[b] OHI OOP in FY 2012 projected based on the moving average three-year growth rate in FY 2011.

1. Choice-Specific Variables

a. Logarithm of Real After-Tax Premiums

We obtained state-level data on the employee's share of health insurance premiums from the 1999–2012 MEPSs.[31] The employee's share is deducted from before-tax earnings, so it provides a tax savings. We subtracted an estimate of the individual's federal and payroll tax savings to obtain the after-tax premium cost. Unlike OHI, the TRICARE Prime premium is paid in after-tax dollars so there are no tax savings to net out. Our data span FY 2000–2012, so premiums are adjusted for general inflation using the CPI-U_t from the BLS. We expect higher real after-tax premiums to reduce insurance demand.[32]

b. Logarithm of Real After-Tax Out-of-Pocket Expense

We define a "standard bundle" of medical services for a typical Retiree family and estimate the OOP expenses for that bundle under each plan over time. The estimated expense is not what families actually spend; it is an OOP index holding constant utilization.[33] Although there are exceptions, for the most part OOP expenses are paid for in after-tax dollars. The variable is the logarithm of the OOP index divided by CPI-U_t. We expect higher real after-tax OOP to reduce insurance demand.

2. Individual-Specific Factors

a. Logarithm of Real Disposable Family Income

The FY 2000–2012 HCBSs did not collect data on family income. To overcome this data problem, we constructed family income prediction models with data from the (one-time) 2003 Survey of Retirees. We used this model to predict expected family income for Retirees in FYs 2000–2012. We subtracted estimates of federal income and payroll taxes and divided by CPI-U_t to estimate their real disposable incomes.[34] The effect of income on insurance choice is indeterminate *a priori*. Previous civilian studies find that income

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[31] Data for CY 1999–2012 are from the MEPS website. Data for fiscal years are derived from calendar year observations, e.g., FY 2012 = 0.25*CY2011 + 0.75*CY 2012.

[32] The decision depends on the after-tax premium so there is some variability *across individuals* due to differences in marginal tax rates. But for a given individual, each insurance choice has a different after-tax premium. That is what makes it a "choice-specific" variable.

[33] For details on the construction of the OOP index, see Appendix A.

[34] For details on the estimation of real disposable income and marginal tax rates, see Appendix B.

reduces the likelihood of selecting an HMO. Based on those findings, we expect higher income to reduce the probability of choosing TRICARE Prime.

b. Sponsor Age Group Dummy Variables

Sponsor's age is included as a proxy for family health risk. As health risk increases, a family will value medical care productivity more highly. Medical care productivity is greater under OHI, so we expect greater sponsor age to increase OHI and reduce the demand for TRICARE plans. For greater accuracy we include dummies for age groups 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, and 60–64 rather than a continuous variable. Those less than 25 years of age are the base group.

c. Proxies for Travel Time to the MTF

A family residing within forty miles of a military hospital is in its "catchment area." Beneficiaries can enroll in TRICARE Prime and use military providers at the hospital essentially for free. Some military clinics are also TRICARE enrollment sites where a family can also obtain free care. A family residing within twenty miles of a clinic is in its "prism area."[35]

Prime enrollees in a catchment or prism area can obtain health care on a priority basis close to home; co-payments and travel costs are negligible. We include dummy variables (INCATCH) if the beneficiary lives in a catchment area, or (INCLINIC) if he lives in a prism area (but not in a catchment area). We expect these variables to increase TRICARE Prime enrollment.[36]

d. Proxies for Availability of OHI

Employer-sponsored group health insurance is likely to be available to most military Retiree families; according to the 2003 Survey of Retirees, about 90 percent of Retiree families have civilian earnings. However, there are factors that affect the likelihood that OHI is available to the family.

1) Single-Survivor Family

According to the HCBS, 96 percent of Retirees are married. Of the few single families, some are headed by a surviving spouse. We expect this family type less likely to be eligible for OHI. We include a dummy variable SURVIVOR for single survivor Retiree families. We expect SURVIVOR to reduce OHI for Retirees.

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[35] A catchment area may also include a military clinic.

[36] MTF proximity variables are constructed by matching HCBS ZIP codes and annual CAD files.

2) Unemployment

OHI eligibility varies over the business cycle. During a recession, unemployment increases and some workers are forced to take part-time jobs, which offer fewer benefits. We include the county unemployment rate to measure this cyclical factor.

3) Percent Eligible for OHI

There has been a downward trend in OHI eligibility per civilian employee. It declined by about 10 percent from FY 2000 to FY 2012. This may be due to sharp increases in OHI premiums. Employers reacted by using more part-timers so the average availability of OHI per employee declined. For labor force participants, OHI eligibility also varies by area due to differences in industrial mix, unionization, and unemployment. To measure the downward trend (not captured by unemployment), we include the percent of employees in the region eligible for OHI. We expect "Percent Eligible" to increase OHI.

3. Trends in Variables

Table 5 provides trends in explanatory factors by plan selected. Premiums and OOP are greatest under OHI, lower under S/E, and lowest under Prime. Relative costs of OHI versus Tricare increased over the sample period. From FY 2000 to FY 2012, OHI costs increased while those under TRICARE were constant (S/E premiums) or declined. Income and age are greatest for those with OHI. INCATCH is greatest for those with Prime. These trends and differences foreshadow the findings from the logit model.

Table 6 provides trends for the entire sample. There were declines in real income, increases in unemployment, and declines in OHI eligibility. The logit analysis will show that these contributed to the declines in OHI that we observe over time.

Table 5. Trends in Variables by Insurance Choice

Insurance Type	Factor	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Prime	Premium	$616	$596	$588	$574	$561	$543	$524	$512	$490	$492	$484	$471	$520
	Out-of-Pocket	$570	$458	$408	$395	$402	$329	$328	$325	$307	$305	$293	$304	$318
	Income	$94,708	$93,348	$90,020	$90,208	$91,188	$90,466	$90,443	$91,370	$89,155	$84,891	$83,398	$85,019	$84,626
	Age Group	53.5	52.9	53.0	53.4	53.3	52.2	52.4	52.2	52.7	52.9	53.1	53.4	53.7
	Proxies for Distance to MTF													
	In-Catchment	61.44%	62.24%	61.38%	60.91%	59.59%	56.84%	51.66%	49.83%	52.02%	49.95%	49.18%	47.95%	51.10%
	In-Clinic	19.49%	20.00%	17.56%	17.12%	18.31%	17.65%	21.11%	22.24%	21.20%	22.67%	22.97%	22.78%	21.02%
	Proxies for Availability of OHI													
	Survivor	2.10%	3.20%	3.17%	3.81%	3.08%	3.07%	2.58%	2.78%	2.19%	3.01%	2.56%	2.79%	2.71%
	Unemployment	4.02%	4.25%	5.50%	5.69%	5.28%	5.06%	4.69%	4.46%	4.89%	8.06%	9.29%	9.01%	8.16%
	Percent Eligible for OHI	68.33%	67.50%	66.21%	66.59%	66.29%	66.55%	65.22%	66.01%	67.15%	68.34%	66.93%	65.36%	64.56%
OHI	Premium	$1,552	$1,631	$1,796	$2,015	$2,145	$2,153	$2,265	$2,406	$2,529	$2,620	$2,711	$2,819	$2,896
	Out-of-Pocket	$1,328	$1,356	$1,430	$1,555	$1,615	$1,537	$1,555	$1,551	$1,441	$1,458	$1,488	$1,525	$1,551
	Income	$96,981	$95,452	$92,179	$92,621	$94,727	$92,179	$92,588	$92,922	$90,031	$85,600	$84,109	$85,429	$85,430
	Age Group	55.1	55.0	55.2	55.6	55.6	55.1	55.4	56.2	56.4	56.9	57.1	57.9	57.5
	Proxies for Distance to MTF													
	In-Catchment	40.61%	38.63%	38.09%	36.60%	35.29%	36.04%	32.48%	27.37%	28.94%	28.58%	28.84%	28.82%	27.88%
	In-Clinic	20.80%	21.75%	16.67%	18.83%	18.34%	17.72%	18.20%	20.66%	18.39%	17.74%	19.98%	17.01%	16.20%
	Proxies for Availability of OHI													
	Survivor	1.25%	1.90%	3.33%	2.90%	2.68%	3.44%	3.03%	1.77%	3.71%	3.53%	2.92%	3.56%	3.06%
	Unemployment	3.86%	4.16%	5.45%	5.64%	5.26%	5.04%	4.64%	4.44%	4.94%	8.26%	9.33%	8.85%	8.09%
	Percent Eligible for OHI	68.51%	68.12%	66.59%	66.90%	66.99%	67.59%	66.61%	66.87%	67.55%	68.57%	67.44%	65.73%	65.02%
Standard/ Extra (S/E)	Premium	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Out-of-Pocket	$1,514	$1,209	$1,125	$1,150	$1,049	$986	$947	$937	$916	$912	$850	$912	$911
	Income	$92,959	$90,964	$87,237	$87,253	$87,795	$85,559	$86,884	$87,855	$85,648	$80,175	$78,409	$79,600	$79,954
	Age Group	53.9	54.1	53.9	54.6	55.0	53.2	53.5	54.5	54.7	54.7	54.9	54.8	55.1
	Proxies for Distance to MTF													
	In-Catchment	36.92%	35.36%	31.40%	30.97%	29.05%	30.05%	27.36%	23.32%	23.23%	25.74%	23.27%	23.07%	22.79%
	In-Clinic	14.89%	15.95%	14.13%	12.47%	12.50%	12.77%	12.70%	16.73%	16.05%	14.39%	16.30%	15.20%	12.29%
	Proxies for Availability of OHI													
	Survivor	2.92%	4.74%	5.12%	6.00%	5.90%	5.88%	5.30%	5.52%	5.43%	6.89%	5.42%	6.76%	5.36%
	Unemployment	3.97%	4.39%	5.58%	5.73%	5.43%	5.15%	4.73%	4.56%	4.98%	8.30%	9.46%	9.07%	8.06%
	Percent Eligible for OHI	68.58%	67.87%	66.53%	65.98%	66.11%	66.17%	65.13%	66.35%	67.28%	67.76%	66.58%	64.92%	64.26%

Table 6. Trends in Variables for the Entire Sample

Fiscal Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Real Premium	$723	$743	$795	$864	$902	$899	$930	$973	$1,007	$1,038	$1,065	$1,097	$1,139
Real Out-of-Pocket Costs	$1,137	$1,008	$987	$1,033	$1,022	$951	$943	$938	$888	$892	$877	$914	$927
Real Disposable Income	$95,307	$93,689	$90,233	$90,402	$91,605	$89,709	$90,120	$90,879	$88,523	$83,861	$82,267	$83,690	$83,548
Age of sponsor	54.3	54.1	54.2	54.6	54.5	53.4	53.6	54.0	54.2	54.4	54.5	54.7	54.9
Proxies for Distance to MTF													
In Catchment Area Dummy	45.63%	44.82%	43.87%	43.78%	43.20%	43.16%	39.45%	36.62%	38.39%	38.20%	37.66%	37.29%	38.92%
In Prism Area Only Dummy	18.92%	19.76%	16.31%	16.61%	16.86%	16.38%	17.99%	20.35%	19.13%	19.27%	20.53%	19.55%	17.73%
Proxies for Availability of OHI													
Survivor	1.92%	3.01%	3.73%	4.01%	3.64%	3.93%	3.44%	3.22%	3.42%	4.14%	3.39%	4.00%	3.49%
Unemployment	3.93%	4.25%	5.50%	5.68%	5.31%	5.08%	4.68%	4.48%	4.92%	8.17%	9.34%	8.99%	8.12%
Percent Eligible for OHI	68.48%	67.87%	66.45%	66.55%	66.49%	66.78%	65.61%	66.34%	67.29%	68.25%	66.96%	65.32%	64.57%

C. Estimates of the Logit Models

The model used in Table 4 is estimated with 181,153 observations in FYs 2000–2012, for which data are available on all variables.[37] Estimates are given in Table 7.[38] Statistical tests for the entire model (Wald chi2) and all but one of the explanatory variables (z-value) are significant at the 1 percent level. As expected, premiums and OOP expenses have negative effects on insurance choice.

[37] The sample consists of Retiree sponsors and spouses 25 to 64 years old in health service regions 1 to 12 in FYs 2000–2012.

[38] The Retiree model was estimated using population weights from the HCBSs with STATA software.

Table 7. Logit Model of Health Insurance Choice for Military Retirees

Variable	Coefficient	Standard Error	z- value
PREMIUM	-0.428	0.028	-15.540
OOP	-0.744	0.038	-19.730
INCOME*D1	0.595	0.040	14.690
INCOME*D2	1.062	0.043	24.850
AGEGROUP 25_29*D1	1.156	0.363	3.180
AGEGROUP30_34*D1	1.570	0.333	4.720
AGEGROUP35_39*D1	1.778	0.317	5.610
AGEGROUP40-44*D1	2.190	0.311	7.040
AGEGROUP45_49*D1	2.141	0.310	6.910
AGEGROUP50_54*D1	1.900	0.310	6.130
AGEGROUP55_59*D	1.747	0.310	5.640
AGEGROUP60_64*D1	1.656	0.309	5.350
AGEGROUP25_29*D2	0.704	0.538	1.310
AGEGROUP30_34*D2	1.253	0.508	2.470
AGEGROUP35_39*D2	1.422	0.488	2.910
AGEGROUP40_44*D2	1.730	0.483	3.580
AGEGROUP45_49*D2	2.194	0.482	4.550
AGEGROUP50_54*D2	2.283	0.482	4.740
AGEGROUP55_59*D2	2.356	0.482	4.890
AGEGROUP60_64*D2	2.576	0.481	5.350
Proxies for Distance to MTF			
INCATCH*D1	1.068	0.029	37.190
INCATCH*D2	0.381	0.021	18.320
INCLINIC*D1	1.180	0.025	46.290
INCLINIC*D2	0.417	0.029	14.600
Proxies for Availability of OHI			
SURVIVOR*D1	-0.551	0.044	-12.620
SURVIVOR*D2	-0.666	0.049	-13.490
UNEMPLOYMENT*D1	0.557	0.023	24.400
UNEMPLOYMENT*D2	0.100	0.026	3.820
PERCENTELIGIBLE*D1	-0.823	0.152	-5.430
PERCENTELIGIBLE*D2	1.295	0.168	7.700
Observations	181,153		
Wald chi2	14084.7		

Table 8 reports elasticities derived from the coefficient estimates.[39] OOP has a strong negative effect on the probability of plan choice: the elasticities are -0.431 for Prime, -0.505 for OHI, and -0.552 for S/E. The premium elasticities are also negative and, as expected, they are smaller: -0.248 for Prime, -0.291 for OHI, and -0.317 for S/E. Table 8 also reports cross-elasticities derived from the coefficient estimates. For choice-specific variables, these are assumed to be equal.[40] For example, the effect of an increase in OHI premiums on Prime and S/E (cross-elasticity) is 0.137; for OHI OOP, it is 0.239.

Higher income increases the probability of choosing OHI (0.471) and reduces that of choosing S/E (-0.591); it has essentially no effect on Prime (-0.004). As expected, higher unemployment reduces OHI and higher Percent Eligible for OHI increases OHI. In-catchment and in-clinic increase Prime; in-catchment reduces S/E. Sponsor age strongly increases OHI, strongly reduces S/E, and has a small positive effect on Prime.

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[39] According to Greene, *Econometric Analysis* (697), the marginal effect of an individual-specific level variable in the logit model is given by $P_j[\beta_j - \Sigma_k P_k \beta_k]$. So for logarithmic variables such as real disposable income, the elasticity is given by $\beta_j - \Sigma_k P_k \beta_k$. Greene (700) also gives the elasticity for a choice-specific variable. For logarithmic variables, the direct elasticity is given by $\varepsilon_{jj} = \beta(1 - P_j)$; the cross- elasticities are the same, by $\varepsilon_{jk} = -\beta P_k$.

[40] Ibid.

Table 8. Insurance Choice Elasticities for Retirees

Factor	Prime	OHI	S/E
Premium, Prime	-0.248	0.18	0.18
Premium, OHI	0.137	-0.291	0.137
Premium, S/E	0.111	0.111	-0.317
OOP Cost, Prime	-0.431	0.313	0.313
OOP Cost, OHI	0.239	-0.505	0.239
OOP Cost, S/E	0.192	0.192	-0.552
Income	0.004	0.471	-0.591
Sponsor Age Group, 25-29	0.002	0	-0.004
Sponsor Age Group, 30-34	0.004	0.002	-0.009
Sponsor Age Group, 35-39	0.012	0.005	-0.026
Sponsor Age Group, 40-44	0.064	0.023	-0.133
Sponsor Age Group, 45-49	0.073	0.08	-0.219
Sponsor Age Group, 50-54	0.068	0.138	-0.282
Sponsor Age Group, 55-59	0.058	0.195	-0.336
Sponsor Age Group, 60-64	0.043	0.344	-0.498
Proxies for Distance to MTF			
In-Catchment	0.203	-0.078	-0.233
In-Clinic	0.102	-0.039	-0.116
Proxies for Availability of OHI			
Survivor	-0.004	-0.008	0.016
Unemployment	0.29	-0.167	-0.267
Percent Eligible for OHI	-0.595	0.817	-0.046

D. Sensitivity Analyses

Most previous studies include just premiums as the price variable; we also included OOP expenses. Here we test the sensitivity of the results to alternative specifications by including (1) premiums and OOP expenses separately; (2) just premiums; (3) just OOP expenses; and (4) the sum of premiums and OOP expenses. Results for Prime are summarized in Table 9.

If one includes just premiums, the elasticity for Prime is -0.438; the Wald chi2 is 13776.9. The elasticity is similar to the average for a civilian HMO obtained in previous studies, -0.38. However, with both premiums and OOP expenses in the model, the elasticity for premiums falls to -0.248; the OOP elasticity is -0.431 and, as expected, it is greater than the premiums elasticity. *The total price elasticity is -0.679*. The fit of the model is better: the Wald chi2 increases from 13776.9 to 14084.7.

In our sample, most of the price variation over time is due to increases in OHI OOP and OHI premiums: these are positively correlated. If only premiums are included, its elasticity is biased high due to omitted variable bias. But the total price elasticity is biased downward because it excludes OOP, an important component.

If only OOP is included, its elasticity is -0.66, similar to the model with both premiums and OOP included; however, the Wald chi2 of 13806.6 is lower. If one adds the two components and includes a single price variable, the elasticity is -0.618 and the fit is the best; the Wald chi2 is 14230.4. However, the individual elasticities equal the elasticity of price times the share of price accounted for by each component. Given that premiums account for about 60 percent of total costs, for Prime this implies elasticities of -0.37 for premiums and -0.25 for OOP. We expect the reverse pattern.[41]

We conclude that both OOP and premiums should be in the model; including them improves the fit of the model and makes it more useful for forecasting and policy analyses. We prefer the model with the variables separately included, because the elasticities are statistically different and results are more consistent with economic theory.

Table 9. Alternative Health Insurance Choice Models for Retirees

Model	Parameter	Premium	OOP	Price	Wald chi2
Premium and OOP Separately	Coefficient	-0.428	-0.744	N/A	
	z-value	(-15.5)	(-19.7)	N/A	14084.7
	Elasticity of Prime	-0.248	-0.431	N/A	
Premium Only	Coefficient	-0.755	N/A	N/A	
	z-value	(-35.1)	N/A	N/A	13776.9
	Elasticity of Prime	-0.438	N/A	N/A	
OOP Only	Coefficient	N/A	-1.140	N/A	
	z-value	N/A	(-38.2)	N/A	13806.6
	Elasticity of Prime	N/A	-0.661	N/A	
Price = Premium+OOP	Coefficient	N/A	N/A	-1.065	
	z-value	N/A	N/A	(-41.9)	14230.4
	Elasticity of Prime	-0.37	-0.25	-0.618	

[41] Based on the theoretical discussion in Section 4.A, Expected Utility Theory.

E. Analysis of Within Sample Predictions

The conditional logit assumes equal cross-elasticities, which implies that an increase in the price of one plan causes a proportional shift into the others. This is known as the independence of irrelevant alternatives (IIA) assumption.[42] The assumption does not hold in our sample. Table 10 compares actual insurance choices and predictions from the logit model. There were large increases in OHI premiums and OOP between FY 2000 and FY 2012. They led to almost one-for-one increases in TRICARE Prime and very little increases in S/E. Because of the IIA assumption, the conditional logit model over-predicts the increase in S/E and under-predicts the increase in TRICARE Prime. The estimated OHI cross-elasticities for premiums and OOP are biased: too high for S/E and too low for Prime.[43]

The solution is to estimate models that relax the IIA assumption, e.g., conditional probit or nested logit. We attempted to obtain full information maximum likelihood estimates for these models using STATA software. However, the models did not converge after 100 iterations.[44] In future research, we will consider estimating nested logit models using sequential estimation methods.

Table 10. Analysis of Within Sample Predictions in FY 2000–2012

	Prime			OHI			S/E	
FY	Actuals	Prediction	Error	Actuals	Prediction	Error	Actuals	Prediction	Error
2000	0.286	0.298	0.012	0.459	0.495	0.036	0.254	0.207	-0.048
2001	0.297	0.339	0.041	0.449	0.432	-0.017	0.253	0.229	-0.024
2002	0.321	0.388	0.067	0.426	0.373	-0.053	0.254	0.240	-0.014
2003	0.354	0.409	0.055	0.392	0.348	-0.044	0.254	0.243	-0.011
2004	0.390	0.400	0.010	0.359	0.336	-0.023	0.251	0.264	0.013
2005	0.419	0.427	0.008	0.317	0.308	-0.009	0.265	0.266	0.001
2006	0.435	0.418	-0.017	0.296	0.298	0.002	0.269	0.284	0.015
2007	0.459	0.413	-0.046	0.278	0.300	0.022	0.263	0.287	0.025
2008	0.471	0.425	-0.046	0.279	0.294	0.015	0.250	0.281	0.031
2009	0.484	0.477	-0.008	0.259	0.265	0.006	0.257	0.259	0.001
2010	0.505	0.501	-0.003	0.235	0.239	0.004	0.260	0.260	0.000
2011	0.522	0.502	-0.019	0.217	0.238	0.022	0.262	0.259	-0.002
2012	0.534	0.478	-0.056	0.201	0.244	0.042	0.265	0.279	0.013

[42] See footnote 39.

[43] A Hausman test confirms that the IIA assumption does not hold.

[44] Not totally unexpected when estimating these complicated models with numerous explanatory variables.

5. Summary and Conclusions

This paper analyzes the health insurance choices among broad plan types for military Retiree families under age 65. The available plans are (1) TRICARE Prime, (2) OHI, and (3) TRICARE S/E. The analysis is undertaken by estimating a conditional logit model with individual-level data on insurance choices from the DoD HCBSs in FY 2000–2012. Supplementary data used to construct explanatory variables are from the TMA, Department of Health and Human Services, BLS, IRS, and DoD's Office of the Actuary.

Previous studies analyze civilian employer-sponsored group insurance (OHI) and typically include just premiums as the price variable. They find that demand is "inelastic;" the average premium elasticity for HMOs is -0.38 across studies. However, the studies omit an important component of price, OOP expenses for deductibles and co-pays. As a result, they overestimate the premium elasticity and underestimate the price elasticity.

We provide evidence that both premiums and OOP expenses affect insurance choices. In our sample, the elasticities are -0.248 for premiums and -0.431 for OOP expenses. The total price elasticity for TRICARE Prime (sum of the elasticities for premiums and OOP expenses) is -0.68. It is still inelastic (i.e., less than 1.0), but substantially higher than from a model estimated with our sample that includes only premiums (-0.438).

We find that income and age increase the demand for OHI, and proximity to free care at MTFs increases TRICARE Prime. OHI eligibility for civilian employees increases OHI and unemployment reduces it. The findings are current and relevant for TRICARE forecasting and policy analyses. However, the cross-price elasticities for OHI are biased due to violation of the IIA assumption. This needs to be addressed in future research.

Between FY 2000 and FY 2012, 26 percent of Retiree families switched from OHI to Prime. They switched primarily because of sharp increases in *relative prices* for OHI. OHI prices rose while real TRICARE prices fell; the major culprit was increased OHI premiums. Other contributing factors were increases in unemployment, declines in the OHI eligibility for civilian workers, and declines in real disposable income.

Between FY 2000 and FY 2012 the growth of "real" OHI premiums averaged 7.2 percent per year. It will slow down in the future. The Centers for Medicare & Medicaid Services (Office of the Actuary) predicts that in FY 2013–2018, premiums for all private

sector workers will increases by only 4 percent after adjusting for general inflation. This will substantially lower the switching rate. However, unless DoD indexes TRICARE premiums and OOP expenses to those of OHI, it faces the continued return of formerly non-reliant beneficiaries and chronic above-average health care cost growth.

This research sheds light on how price affects the demand for health insurance. A few caveats are worth mentioning regarding the accuracy of the estimates. Access and quality for each plan are assumed constant. Over time, there was an increase in the TRICARE network, which is likely to increase demand for the TRICARE plans. As a result, the OOP and premium estimates may be too high due to omitted variable bias. The under-prediction of Prime and over-prediction of TRICARE S/E in the validation test suggests using another model that does not impose the IIA assumption. Future research will investigate these issues to refine estimates of direct and cross-price elasticities.

Appendix A.
Real Out-of-Pocket Expense Index

The out-of-pocket (OOP) expense index measures the cost that would be paid by a typical TRICARE family under each plan for a fixed bundle of medical services. The index is adjusted for marital status, sponsor age, and free care at military treatment facilities (MTFs). Most Retirees are married, and the sponsor is 45–64 years old. To illustrate the methodology, this appendix constructs an OOP index for a typical married Retiree family.

Utilization Per Capita

Table A-1 reports average medical care utilization rates per capita by age group and gender for those covered by private health insurance (OHI). Utilization data are from the 2002 Medical Expenditure Panel Survey (MEPS). Medical services include outpatient visits, hospital discharges, and prescription drugs. Age/gender groups are less than 18; 18–44 male, 18–44 female, 45–64 male, and 45–64 female. Utilization is a function of age. For example, a typical 18–44-year-old male had 3.14 outpatient visits, 0.02 discharges, and 3.35 prescriptions (including refills). A typical 45–64 year old male had 6.01 outpatient visits, 0.08 discharges, and 11.58 prescriptions.

Table A-1. Average Medical Care Utilization Per Capita for Individuals Covered by OHI in 2002, by Age and Medical Service Type

Medical Service	Ages <18	Ages 18–44		Ages 45–64	
	All	Male	Female	Male	Female
Outpatient Visits*	3.57	3.14	6.58	6.01	9.47
Inpatient Discharges	0.02	0.02	0.10	0.08	0.09
Prescriptions	2.55	3.35	7.16	11.58	16.43

* Physician and non-physician office-based, hospital outpatient, emergency room, and ambulatory surgeries.

TRICARE Family Composition

Table A-2 reports typical family size and composition in FY 2000–2004 for married Retiree families with a sponsor under 65 years of age. Based on administrative records, the typical family consists of a sponsor, spouse, and 0.65 children. We used Table A-1

and Table A-2 to estimate medical service bundles for these families whose sponsors were either 18–44 or 45–64 years of age.

Table A-2. Typical Demographics for Married Retiree Families in FY 2001–2004

Sponsor	Spouse	Children
1	1	0.65

Average Purchased Care Out-of-Pocket Expenses: TRICARE vs. OHI

We estimated average co-pays per unit of service in FY 2000–2012 by medical service, sponsor age group, and insurance type. Average co-pays per unit for TRICARE are from all the administrative records in each year; for OHI they are from MEPS. There are large differences in co-pays across plans. To illustrate the differences, Table A-3 reports average co-pays in FY 2010 by medical service and insurance plan for Retiree families with a sponsor 45–64 years of age.

Prescription co-pays average $21 under OHI compared to only $7 under TRICARE (co-pays are the same under Prime and S/E). Co-pays for outpatient visits are $13, Prime; $33, S/E; and $53, OHI. Prime has the lowest co-pay per discharge, $173. It costs much more under OHI ($611) and S/E ($787).

Table A-3. Average Co-Pays Per Unit of Service for Married Retiree Families in FY 2010: For Sponsor Age 45–64 by Medical Service and Plan Type

Service	Insurance	Co-Pay
Discharge	OHI	$611
	Prime	$173
	S/E	$787
Outpatient	OHI	$53
	Prime	$13
	S/E	$33
Prescription	OHI	$21
	Prime	$7
	S/E	$7

Out-Of-Pocket Expense Index

Using data on utilization rates, family composition, and average co-pays for purchased care, we calculated "initial" OOP indexes for OHI, Prime, and S/E. These assume all TRICARE medical services are "purchased care" and subject to co-pays. In

reality, beneficiaries obtain some care for free at MTFs, especially those enrolled in Prime living near a military hospital. For individual HCBS respondents, we adjust OOP for free direct care, which varies by medical service, in-catchment status, and insurance type.[1] The final step is to account for general inflation. To do this we divide the adjusted OOP index by the CPI-U (FY 2012).

Table A-4 reports the OOP Index in constant FY 2012 dollars for married Retiree families with a sponsor 45–64 years of age. From FY 2000 to FY 2012, "real" OOP increased sharply under OHI and declined under TRICARE. In particular, OHI OOP increased by 15.9 percent; it declined by 44.3 percent under Prime and 40.4 percent under S/E. So *relative* prices increased by about 60 percent under OHI versus TRICARE. This induced Retirees to drop OHI and choose TRICARE plans.[2]

Table A-4. OOP Indexes for Married Retiree Families for Sponsor Age 45-64 by Plan Type, FY 2000–2012

Sponsor: Retiree Age 45–64			
	Insurance Type		
Year	OHI	Prime	S/E
2000	$1,461	$999	$1,759
2001	$1,500	$809	$1,388
2002	$1,583	$716	$1,299
2003	$1,708	$686	$1,315
2004	$1,781	$689	$1,196
2005	$1,761	$596	$1,155
2006	$1,774	$583	$1,112
2007	$1,752	$566	$1,086
2008	$1,614	$537	$1,061
2009	$1,637	$533	$1,041
2010	$1,677	$510	$983
2011	$1,691	$519	$1,034
2012	$1,693	$556	$1,048
Change – 2012 vs. 2000	**15.9%**	**-44.3%**	**-40.4%**

[1] Adjustment factors for free direct care are from all TRICARE administrative records in FY 2006.

[2] We used a similar methodology to estimate OOP indexes for single Retiree families and married Retirees families with a sponsor ages 18–44.

Appendix B.
Estimation of Real Disposable Income for Retiree Families

The FY 2000–2012 HCBSs did not collect data on family income. To overcome this problem, we used regression models to predict family income. From this, we subtracted estimates of federal and payroll taxes, and divided by the CPI-U to estimate real disposable family income. The steps in this estimation are discussed below.

Estimation of Regression Models to Predict Retiree Family Income

Family income is given by Equation B-1:

$$\text{Family Income} = [\text{Probability Civilian Earnings} > 0] \times \text{Expected}[\text{Civilian Earnings} > 0] + \text{Expected}[\text{Other Income}] \quad \text{(B-1)}$$

Family income equals expected civilian earnings plus expected "other income." For Retiree families, "other income" is "passive income" mostly from the sponsor's DoD pension. We estimated separate models for the components of Equation B-1 and a reduced form equation. The latter fit the data best. Explanatory variables and data sources for the components of Equation B-1 are in Table B-1. Most of the data were from the 2003 Survey of Retirees, a one-time survey that collected extensive data on incomes of military Retirees. For measures of the local economy, we used county-level data from the Bureau of Labor Statistics (BLS) on unemployment and earnings per worker.

Table B-1. Retiree Family Income Models: Variables and Data Sources

Variable	Data Source	Definition
Age 25–29	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 25–29
Age 30–34	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 30–34
Age 35–39	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 35–39
Age 40–44	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 40–44
Age 45–49	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 45–49
Age 50–54	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 50–54
Age 55–59	DoD Survey of Retirees 2003	Dummy variable if sponsor is age 55–59
Sponsor male	DoD Survey of Retirees 2003	Dummy variable if sponsor is a male
Logarithm of Unemployment	Bureau of Labor Statistics	Unemployment in the county where the sponsor resides
Logarithm of Earning per Worker	Quarterly Censuses (2003) of Employment and Wages	Real wage in the county where the sponsor resides in 2003
Senior Enlisted	DoD Survey of Retirees 2003	Dummy variable if the sponsor is rank E-5 through E-9
Junior Officer	DoD Survey of Retirees 2003	Dummy variable if the sponsor is rank O-1 through O-4
Senior Officer	DoD Survey of Retirees 2003	Dummy variable if the sponsor is rank O-5 through O-10
Warrant Officer	DoD Survey of Retirees 2003	Dummy variable if the sponsor is rank W-1 through W-5

It is well known that family income has a lognormal distribution. Separate logarithmic models were estimated for single and married Retiree families. Table B-2 reports the reduced form model for married Retirees; Table B-3, the model for singles. As expected, income increases with wages, declines with unemployment, and is higher for former officers. For married families, income peaks at age 50–54. It declines slightly for those 55–59 and then drops off sharply for those who are 60–64 (base) as civilian retirements and part-time work kicks in. Similar patterns are observed for single families, except that income peaks at age 55–59.

Table B-2. Reduced Form Logarithmic Family Income Model for Married Retirees

Variable	Coefficient	Standard Error
Constant	5.839	0.226
Age 25–29	0.102	0.083
Age 30–34	0.110	0.067
Age 35–39	0.187	0.022
Age 40–44	0.181	0.014
Age 45–49	0.174	0.013
Age 50–54	0.199	0.013
Age 55–59	0.167	0.013
Sponsor male	-0.096	0.024
Logarithm of Unemployment	-0.146	0.013
Logarithm of Earning per Worker	0.520	0.021
Senior Enlisted	0.144	0.030
Junior Officer	0.544	0.040
Senior Officer	0.696	0.032
Warrant Officer	0.394	0.038
Observations	15693	
Adjusted R-Square	0.2299	
Standard Error of Estimate	0.51768	

Table B-3. Reduced Form Logarithmic Family Income Model for Single Retirees

Variable	Coefficient	Standard Error
Constant	7.327	0.507
Age 20–24	0.212	0.124
Age 25–29	0.149	0.105
Age 30–34	0.149	0.096
Age 35–39	0.142	0.046
Age 40–44	0.163	0.034
Age 45–49	0.126	0.033
Age 50–54	0.116	0.034
Age 55–59	0.141	0.036
Sponsor male	0.156	0.031
Logarithm of Unemployment	-0.195	0.030
Logarithm of Earning per Worker	0.304	0.048
Senior Enlisted	0.311	0.045
Junior Officer	0.696	0.078
Senior Officer	0.884	0.054
Warrant Officer	0.653	0.084
Observations	4111	
Adjusted R-Square	0.1212	
Standard Error of Estimate	0.62339	

Predicting Retiree Family Income in FY 2000–2012 for HCBS Respondents

We predicted family income in FYs 2000–2012 using Table B-2 and Table B-3. Required data in FYs 2000–2012 for the predictions are from the HCBS surveys (sponsor age, rank, gender, and marital status) and from the BLS (county earnings per worker, unemployment, and CPI-U_t).

Predicting Federal Taxes, Payroll Taxes, and Marginal Tax Rates

We estimated federal taxes assuming the Retirees filed the Internal Revenue Service Forms 1040 that were in effect in FYs 2000–2012. The estimate of federal taxes assumes the typical demographics of married and single Retiree families. Besides federal taxes, the analysis provided marginal federal income tax rates used to estimate after-tax insurance premiums.

We estimated payroll taxes as a function of civilian earnings, assumed to be the difference between total family income and passive income. Passive income was

predicted as a function of the average DoD pension given the Retiree's demographics. Data on Retiree pensions for FY 2000–2012 were obtained from DoD's Office of the Actuary.

Predicting Real Disposable Income for HCBS Respondents

The variable in the insurance model is real disposable income. This is derived by subtracting estimates of federal and payroll taxes from the prediction of family income. The final step is to divide disposable income by CPI-U_t to obtain real after-tax family income in FY 2012 dollars.

Illustrations

List of Tables

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Abbreviations

BLS	Bureau of Labor Statistics
CAD	Catchment Area Directory
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CMAC	CHAMPUS Maximum Allowable Charge
CPI	Consumer Price Index
CPI-U	Consumer Price Index for the Urban Population
$CPI\text{-}U_t$	Consumer Price Index for all Urban Consumers
CRI	CHAMPUS Reform Initiative
DoD	Department of Defense
FFS	Fee For Service
FY	Fiscal Year
HCBS	Health Care Beneficiary Survey
HMO	Health Maintenance Organization
IDA	Institute for Defense Analyses
IIA	Independence of Irrelevant Attributes
IRS	Internal Revenue Service
MEPS	Medical Expenditure Panel Survey
MTF	Military Treatment Facility
OHI	Other Health Insurance
OOP	Out-of-Pocket
PCM	Primary Care Manager
PPO	Preferred Provider Organization
S/E	Standard/Extra
TMA	TRICARE Management Authority
ZIP	Zone Improvement Program

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